Medical Comorbidity and Distress in Patients with Irritable Bowel Syndrome: The Moderating Role of Age

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Abstract

Objectives—Irritable bowel syndrome (IBS) affects people across the age spectrum and is highly comorbid with other medical conditions. The aim of this study was to determine the moderating effect of age on the relationship between medical comorbidity and health outcomes in IBS patients.

Methods—Patients ($n = 384$) across the age spectrum (18 to 70) completed questionnaires regarding medical comorbidities, anxiety, depression, IBS symptom severity, and IBS quality of life (QOL).

Results—The mean age was 41 ($SD = 15$). Age interacted with medical comorbidities to predict anxiety, $F(7,354) = 5.82$, $p = .009$, $R^2 = .10$. Results revealed significant main effects for education, $\beta = -.16$, $p < .05$, age, $\beta = -.15$, $p < .05$, medical comorbidities, $\beta = .25$, $p < .05$, and a significant interaction, $\beta = -.15$, $p < .01$. Anxiety was greater among patients with many comorbidities, with this effect being more pronounced for younger adults. Depression, also predicted by the

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interaction between age and comorbidities, showed the same pattern as anxiety. There was no significant interaction between age and medical comorbidities in predicting IBS symptom severity or IBS QOL.

Conclusion—Distress among IBS patients with medical comorbidities varies with age, with higher levels of anxiety and depression among younger adults than their older counterparts. Medical comorbidity may have a more selective impact on psychological distress as compared to IBS symptom severity and quality of life for younger adults with IBS. Distress may increase IBS burden for these patients and complicate its medical management.

Introduction

Irritable bowel syndrome (IBS) is a chronic and potentially disabling disorder that afflicts approximately 25 million Americans. Individuals aged 25–54 [1] have higher rates of IBS than other age groups, causing IBS to often be regarded as a "young person's disease." However, recent studies suggest that IBS is more common among older individuals than previously believed [2;3]. The lower prevalence of IBS among older adults may be a function of low sensitivity of diagnostic criteria in this age group [4]. Another factor that may influence detection of IBS is the higher prevalence of medical comorbidities among older adults [3]. Amid a variety of medical problems, IBS may not be considered clinically meaningful or may be thought to be part of the natural course of aging.

Medical comorbidity among patients with IBS may not only present a unique diagnostic challenge for clinicians but also may pose a significant burden on patients. Although individuals with IBS and medical comorbidities tend to have worse health outcomes than those with IBS alone [5], the impact of medical comorbidity among older adults with IBS has not been specifically examined. This is an important area of research, given that the older population in the United States is growing rapidly, with those aged 65 and older projected to be 83.7 million in 2050, almost double the rates of 43.1 million seen in 2012 [6]. Adverse effects of IBS may be amplified in older adults because of the additive effect of multiple medical problems; however, little is known about how age influences the association between medical comorbidity and health outcomes in patients with IBS.

The aim of this study was to determine the influence of age on the relationship between number of medical comorbidities and clinically relevant health outcomes in a cohort of severely affected IBS patients. We hypothesized that the relationship between number of medical comorbidities and IBS symptom severity, anxiety, depression, and quality of life would be moderated by age, with older adults experiencing greater IBS symptom severity, higher levels of anxiety and depression, and a lower quality of life than their younger counterparts.

Methods

Participants and Procedures

This study is a secondary analysis of a larger National Institutes of Health clinical trial of behavioral treatments for IBS. Patients were recruited primarily through local media coverage and community advertising and referral by physicians in surrounding areas to tertiary care clinics at two academic medical centers in Buffalo, NY, and Chicago, IL. After a brief telephone interview to determine whether interested individuals were likely to meet basic inclusion criteria, patients were scheduled for a medical examination to confirm a Rome III diagnosis of IBS [7], written signed consent was obtained, and psychometric testing was conducted. Eligibility criteria are described more fully elsewhere [5]. Participants ($n = 384$) were primarily Caucasian (89.5%) and female (79.9%) and were represented across the age spectrum (range: 18 to 70 years), with a mean age of 41. Institutional review board approval (UB, May 19, 2009; NU, December 19, 2008) was obtained.

Measures

For the purposes of this study, psychometric testing used the following psychometrically validated measures.

Patient Characteristics—Information was obtained via self-report on participants' age at the time of presentation (in years), gender, race, marital status, income (in thousands of dollars), education, IBS subtype (IBS-constipation, IBS-diarrhea, IBS-mixed, IBS-undifferentiated), duration of symptoms (years), age symptoms began (years), number of recent medical visits (past 3 months), and recent physician visit (yes and no).

IBS Medical Comorbidity—Medical comorbidity was assessed using a comorbidity checklist that covers 112 medical conditions organized around 12 body systems (musculoskeletal, digestive, kidney/genitourinary, endocrine, respiratory, circulatory, cardiovascular, oral, CNS, dermatological, cancer, ear, nose and throat) [8]. Respondents were asked whether a physician had ever diagnosed them with a condition and, if so, whether the condition was present in the past 3 months. A total score was based on the number of medical comorbidities a patient reported.

Anxiety and Depression—Psychological distress was assessed using the 18-item version of the Brief Symptom Inventory (BSI) [9], which has been used extensively in IBS research [10]. Respondents indicated their level of distress on a five-point scale, 0 (not at all) to 4 (extremely). In this study, we analyzed the anxiety and depression subscales. Internal consistency, test-retest reliability, and validity of the BSI-18 are well-established [9].

IBS Symptom Severity—The Irritable Bowel Syndrome Symptom Severity Scale [11] contains five questions measured on a 100-point scale, examining severity of abdominal pain, frequency of abdominal pain, severity of abdominal distension, dissatisfaction with bowel habits, and interference with quality of life. The number of days out of 10 the patient experiences abdominal pain is asked by a final item, and the answer is multiplied by 10. All

five items are summed to create a total score (range: 0 – 500), and scores ranging from 75 – 175 represent mild severity, scores ranging from 175 – 300 represent moderate severity, and a score of 300 or greater represents severe IBS symptoms [11].

IBS Quality of Life—The 34-item IBS-QOL measure [12] evaluates quality of life impairment due to IBS symptoms. Each item is scored on a five-point scale (1 = not at all, 5 = a great deal) that represents one of eight dimensions (dysphoria, interference with activity, body image, health worry, food avoidance, social reaction, sexual dysfunction, and relationships). An overall total score of IBS-related quality of life is transformed to a scale ranging from zero (poor quality of life) to 100 (maximum quality of life).

Statistical Analyses

To determine the relationship between demographic and clinical characteristics, we examined patient characteristics, based on age, number of medical comorbidities, anxiety and depression, IBS symptom severity and IBS quality of life.

Pearson correlations were used to examine the association between age and each of the following: number of medical comorbidities, IBS symptom severity, depression, anxiety, and IBS quality of life. To identify potential confounding variables, these variables were examined as they related to patient characteristics, using independent samples *t*-tests or analyses of variance and Pearson product moment correlations.

Moderated multiple linear regression analyses were conducted to examine whether age interacted with medical comorbidity to predict anxiety, depression, IBS symptom severity, and quality of life. The models were constructed in two steps. Step one included any significant covariates from the previous analyses. Step two included all predictors from step one with the main effects of age and the number of medical comorbidities. Step two also included all predictors from step one, with the addition of the interaction term between age and the number of medical comorbidities. If a significant interaction is found, it means that the relationship of the predictor (number of medical comorbidities) on the outcome (anxiety, depression, symptom severity, or quality of life) differs, based on the moderator (age) of the patient. The shape of any significant interactions between number of medical comorbidities and age was examined by plotting the predicted variables for the dependent variable at one standard deviation above and below the mean for both variables involved in the interaction [13]. A power analysis for our test of the interaction effect with our sample size ($n = 384$) and an alpha level set at .05 resulted in estimates of 80% power for a 2% increase in variance in the dependent measures accounted for, and a 92% power for a 3% increase in variance accounted for in our analyses.

Results

Characteristics of Study Sample

The distribution of age, number of medical comorbidities, and health outcomes (anxiety, depression, IBS symptom severity, and IBS quality of life), across demographic and clinical features is presented for all participants (Table 1). Patients reported moderate-to-severe IBS (IBS-SSS range: 106–473) with symptoms that were present for many years ($M = 16.29$

years, $SD = 14.08$ years). Medical comorbidities were prevalent in the study population, with a range from 0 to 32 comorbidities. The most common medical comorbidity experienced was seasonal allergies (49%), followed by gastroesophageal reflex disease/heartburn (40%), and chronic low back pain (29%). Overall, patients experienced high levels of anxiety ($M = 4.73$, $SD = 4.68$) and depression ($M = 4.13$, $SD = 4.39$) and a low IBS-related quality of life ($M = 56.32$, $SD = 18.23$).

Correlations Between Demographics, Medical Comorbidity, and Health Outcomes

Pearson product-moment correlations (Table 2) indicated that age was positively correlated with the number of medical comorbidities, symptom duration, and with quality of life but not with depression, anxiety or symptom severity. Number of medical comorbidities was correlated negatively with income, and positively with symptom duration and the number of recent medical visits. It was also positively correlated with anxiety, depression, and symptom severity, and negatively correlated with quality of life. In addition, higher anxiety was associated with lower income, more depression, greater symptom severity, and lower quality of life. Higher levels of depression were associated with greater symptom severity and a lower quality of life. Symptom severity and quality of life were also negatively correlated.

Characteristics of Age, Medical Comorbidity, and Health Outcomes Across Demographic and Clinical Features

As is presented in Table 1, women reported significantly higher symptom severity than did men, $t(379) = -2.06$, $p = .040$, and nonwhite patients reported higher levels of depression, $t(376) = -2.10$, $p = .036$. Married patients were significantly older, $t(381) = -5.08$, $p > .001$, and those not married scored higher on depression, $t(375) = 1.97$, $p = .049$. Those with only a high school education were significantly older, $t(382) = 2.86$, $p = .004$, had a greater number of medical comorbidities, $t(380) = 3.46$, $p = .001$, scored higher on anxiety, $t(376) = 2.86$, $p = .004$, depression, $t(3.76) = 4.09$, $p < .001$ and symptom severity, t $(379) = 2.21$, $p = .028$, and lower on quality of life, $t(380) = -3.63$, $p < .001$.

Age as a Moderator between Medical Comorbidity and Health Outcomes

The first series of multiple linear regression models examined the relationship between anxiety (outcome), age (moderator), and medical comorbidities (predictor) (Table 3). In step one, the model was significant, $F(6, 355) = 5.56$, p < .001 and predicted 9% of the variance in anxiety. Education, β $= -.15$, $p = .004$; age, β $= -.16$, $p = .008$; and medical comorbidities, β $= .20$, $p = .001$, were significant predictors of anxiety. In step two, the interaction term between age and the number of medical comorbidities significantly added to the amount of variance in the criterion accounted for in the model, $R^2 = .02$ $F(1,354) = 6.86$, p = .009; and the interaction term significantly predicted anxiety, β $= -.15$, $p = .009$. Examination of the shape of the interaction (Figure 1A) indicated there was no significant effect of age on anxiety for patients with fewer comorbid disorders. However, anxiety was greater among patients with many medical comorbidities, with this effect being more pronounced for younger IBS patients.

A similar analysis was also conducted to predict depression (Table 3). In the first step, the model accounted for a significant amount of variance in depression, $R^2 = .10$ $F(6,355) = 6.30$, $p < .001$. Education $\beta = -.17$, $p = 002$, and medical comorbidities, $\beta = .21$, $p < .001$, were significant predictors of depression. Including the interaction term in step 2 significantly added to the amount of variance accounted for in depression, $R^2 = .03$ $F(1,354) = 13.89$, $p < .001$ and the interaction term significantly predicted depression, $\beta = -.21$, $p < .001$. Inspection of the shape of the interaction (Figure 1B) indicated no significant effect of age on depression for patients with fewer comorbid disorders. However, depression was greater among patients with many medical comorbidities, with a greater effect for younger IBS patients.

The model for IBS symptom severity was also significant, $R^2 = .05$ $F(6,358) = 3.15$, $p = .005$. Marital status, $\beta = .13$, $p = .036$, age, $\beta = -.16$, $p = .005$, and medical comorbidities, $\beta = .18$, $p = .002$, significantly predicted symptom severity. Addition of the interaction term between age and the number of medical comorbidities in step 2 did not account for an additional significant amount of variance in symptom severity, $R^2 = .00$ $F(1,357) = 0.25$, $p < .619$. Similarly, when quality of life was used as the criterion variable, the main-effects model was significant, $R^2 = .07$, $F(6,359) = 5.06$, $p < .001$. Education, $\beta = .13$, $p = .013$, marital status, $\beta = -.12$, $p = .044$, age, $\beta = .21$, $p < .001$, and medical comorbidities, $\beta = -.22$, $p < .001$, were all significant predictors of quality of life. Addition of the interaction term between age and the number of medical comorbidities in step 2 did not account for an additional significant amount of variance in quality of life, $R^2 = .00$ $F(1,358) = 0.09$, $p = .763$.

Discussion

This study sought to assess the moderating relationship between age and number of medical comorbidities and IBS symptom severity, anxiety, depression, and quality of life in a sample of patients with severe IBS. We expected older IBS patients with multiple medical problems to experience worse health outcomes (i.e., greater IBS symptom severity, higher levels of anxiety and depression, and a lower quality of life) than younger adults with the disorder. Contrary to our expectations, we found younger IBS patients with more medical comorbidities to be more distressed than their older counterparts. In addition, the effect of medical comorbidity on health status was most pronounced for mental well-being (anxiety, depression) rather than IBS symptom severity and/or quality and life.

Our findings suggest that medical comorbidity may have a more selective impact on psychological distress (anxiety, depression) as compared to other health outcomes (i.e., IBS symptom severity, quality of life) for younger adults with IBS. Although this finding is somewhat counterintuitive, it echoes previous research that has shown psychological distress to be more common in young adulthood [14;15]. Medical comorbidities may not be perceived as manageable among younger patients, who often face multiple roles and responsibilities, have less experience with life stressors, and may be less prepared to cope. Conversely, older adults might adjust more readily because they regard multiple medical problems as a normative part of the aging process [16].

Our findings are of particular importance given that psychological distress may increase the daily burden of IBS, and complicate medical management, especially for younger IBS patients with significant medical comorbidities. Clinicians should be sensitive to the unique burden that affects younger patients with IBS. Pharmacological (e.g., tricyclic antidepressants, selective serotonin reuptake inhibitors) or behavioral therapies, such as cognitive and behavioral therapy [17;18], may relieve emotional distress of residual symptoms that are not addressed through conventional treatment approaches. As patients gain control of their distress, they may be better able to manage gastrointestinal symptoms and their impact. However, additional research is needed to make more definitive clinical recommendations. Future studies should focus on identifying the role of specific cognitive and behavioral processes on the etiology and course of IBS to best direct clinical care.

These data should be interpreted in light of the study limitations. Our study was cross-sectional; therefore, we cannot infer causation. In addition, for the statistical models with significant interaction effects predicting anxiety and depression, the complete model accounted for a small amount of variance (i.e., 10%) in the dependent measures; given the multiple testing, some of these finding may be due to chance. Traditionally, effect size as expressed in variance accounted for in non-experimental psychosocial research tend to only range from 10% to 30%; however, when dealing with outcomes involving psychological distress such as anxiety and depression, even small effects may have important ramifications for the quality of patients' lives [19]. Furthermore, our cross-sectional data is a snapshot of what may be indicative of a more cumulative effect [20] over time of medical comorbidity on anxiety and depression in IBS patients. A more comprehensive examination that examines the effects of comorbidity over time may have a greater impact and should be tested in a future longitudinal design. Our study also reflects a subset of treatment-seeking individuals with severe IBS who enrolled in a randomized controlled trial; therefore, these results may not generalize to patients from primary care settings, or nonconsulters in the community. We also focused on a limited number of variables believed to be associated with medical comorbidities in patients with IBS. Other factors may have contributed to the pattern of age differences that was found.

Despite these limitations, our study highlighted the importance of considering age when evaluating and treating patients with IBS and comorbid medical problems. Younger patients with IBS experience greater distress than their older counterparts, which may increase the daily burden of IBS and further complicate its medical management. Future epidemiological research with more diverse samples and a longitudinal design may add to our understanding of the influence age has on the relationship between medical comorbidities and health outcomes for patients with IBS.

Acknowledgments

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Highlights

1. IBS affects people of all ages and is comorbid with several medical conditions.

2. Medical comorbidities affect psychological distress in patients with IBS.

3. Medical comorbidities impact psychological distress more for younger IBS patients.

4. Psychological distress may increase IBS burden and complicate treatment.

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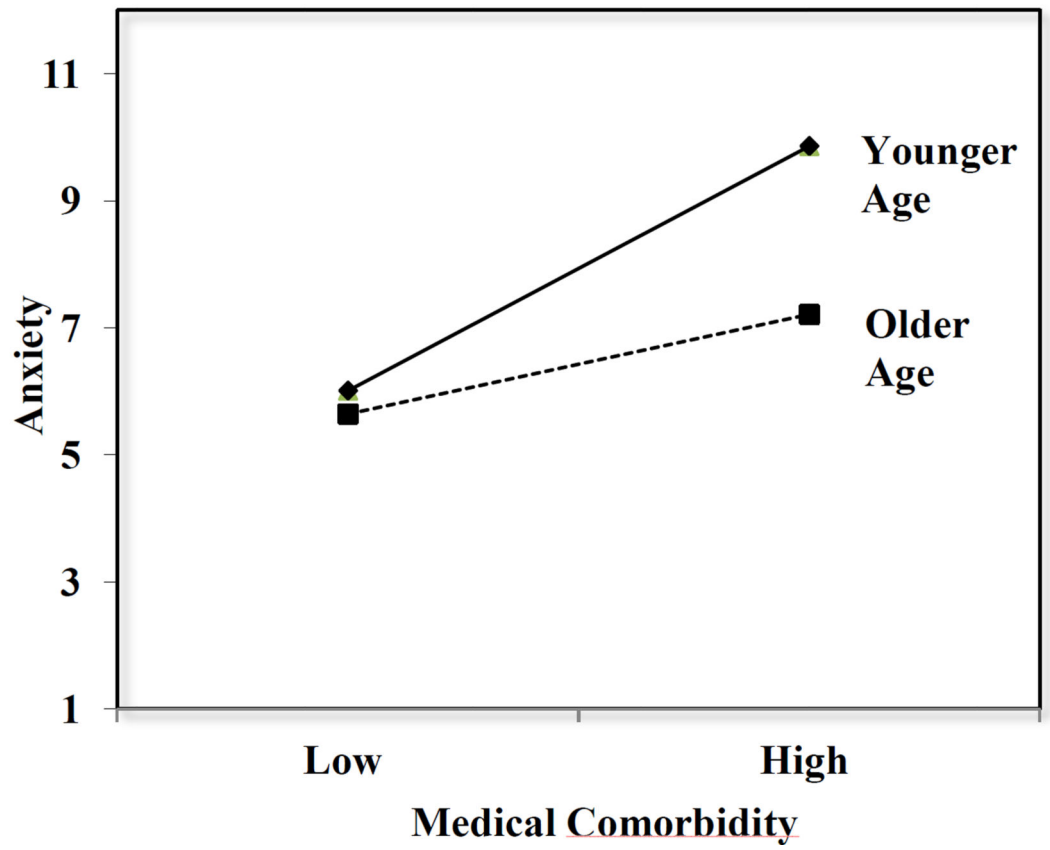
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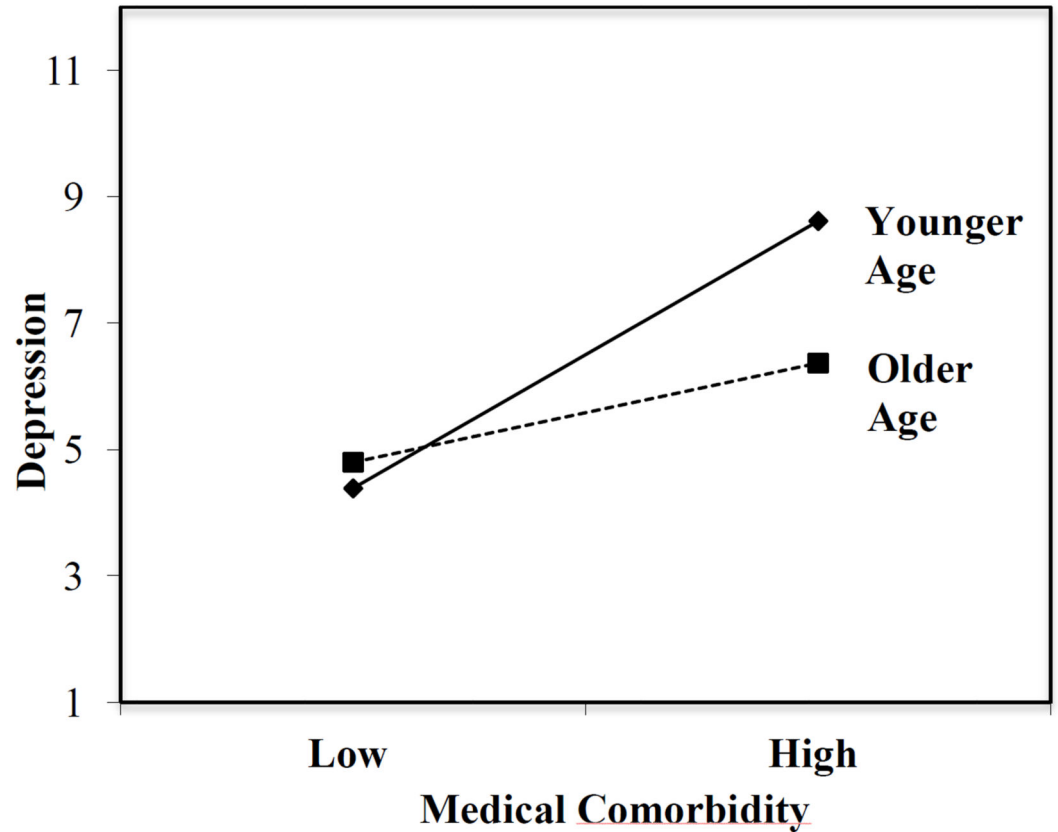
Figure 1.
Age as a Moderator of the Relationship between Number of Medical Comorbidities and Distress Scores for Anxiety (1A) and Depression (1B). Medical comorbidity and age values represented in the figure were calculated at one standard deviation below the mean (low) and one standard deviation above the mean (high). Medical comorbidity ($M = 7.91$, SD = 6.42) is shown for low (1.49) and high (14.33) values. Age ($M = 41.18$, SD = 14.80) is shown for younger (26.38) and older (55.98) age.

Table 1

Distribution of Age at Presentation, Medical Comorbidity, and Health Outcomes, Based on Several Demographic and Clinical Features *(N=384)*

	Age	Comorbidity	Anxiety	Depression	Symptom Severity	Quality of Life	N
	M (SD)	M (SD)	M (SD)	M (SD)	M (SD)	M (SD)	
Gender							
Male	42 (15)	7 (6)	5.55 (5.18)	4.64 (4.51)	267.80 (66.18) *	56.68 (17.69)	77
Female	41 (16)	8 (6)	4.53 (4.54)	4.01 (4.36)	286.79 (72.97)	56.23 (18.39)	307
Race							
White	41 (15)	8 (6)	4.77 (4.68)	3.97 (4.25) *	281.51 (70.22)	56.52 (18.10)	344
Non-White	43 (16)	10 (8)	4.34 (4.79)	5.07 (5.28)	296.59 (85.88)	54.49 (19.50)	32
Marital Status							
Not Married	38 (15) *	8 (7)	4.93 (4.66)	4.48 (4.59) *	280.96 (70.67)	56.57 (17.91)	224
Married	46 (13)	8 (6)	4.44 (4.73)	3.58 (4.04)	286.42 (73.95)	55.73 (18.55)	159
Income[1]							
Below $62.5K	41 (15)	9 (7) *	5.11 (4.87)	4.61 (4.70) *	281.78 (74.23)	55.37 (18.47)	223
Above $62.5K	41 (14)	7 (5)	4.33 (4.49)	3.58 (3.94)	286.09 (68.64)	56.85 (17.97)	146
Education							
High school	44 (16) *	9 (7) *	5.64 (5.45) *	5.32 (5.23) *	293.82 (81.17) *	51.93 (19.84)	140
College	39 (14)	7 (6)	4.22 (4.11)	3.44 (3.66)	276.93 (65.62)	58.86 (16.82) *	244
IBS Subtype[2]							
IBS-C	42 (14)	8 (6)	4.59 (4.73)	4.51 (4.27)	295.96 (72.22)	55.44 (18.28)	109
IBS-D	42 (15)	8 (6)	4.42 (4.19)	3.73 (4.10)	276.77 (74.37)	56.94 (19.17)	165
IBS-M	38 (15)	8 (7)	5.62 (5.48)	4.57 (4.94)	279.19 (68.16)	55.67 (16.86)	91
IBS-U	40 (17)	6 (7)	4.17 (4.25)	3.50 (4.71)	283.61 (64.26)	59.19 (17.18)	18
Duration of Symptoms[1]							
12 Years or Less	35 (14) *	7 (5) *	4.84 (4.79)	4.07 (4.38)	284.31 (74.38)	55.63 (18.07)	192
Over 12 Years	47 (14)	9 (7)	4.64 (4.61)	4.14 (4.41)	280.46 (68.47)	57.31 (18.32)	184
Age of Symptom Onset[1]							
Age 21 or under	35 (14) *	7 (6)	4.84 (4.81)	3.95 (4.52)	285.68 (65.56)	54.53 (18.02) *	196

	Age	Comorbidity	Anxiety	Depression	Symptom Severity	Quality of Life	
	M (SD)	M (SD)	M (SD)	M (SD)	M (SD)	M (SD)	N
Over age 21	47 (13)	9 (7)	4.64 (4.59)	4.27 (4.25)	278.80 (77.57)	58.84 (18.18)	180
Seen physician recently							
No	40 (15)	6 (5)*	4.64 (4.59)	3.85 (4.09)	272.35 (68.35)	58.82 (18.08)	73
Yes	42 (15)	8 (7)	4.76 (4.72)	4.19 (4.46)	285.51 (72.69)	55.74 (18.24)	311

NOTE:

*
$p < .05$,

[1]For descriptive purposes of the table, a median split was conducted on income, duration of symptoms, and age of symptom onset; however, in all other analyses these variables were treated as continuous variables.

[2]IBS - C, irritable bowel syndrome, constipation; IBS-D, irritable bowel syndrome diarrhea; IBS-M, irritable bowel syndrome, mixed; IBS-U, irritable bowel syndrome, undifferentiated.

Table 2

Correlations Among Study Variables

	1	2	3	4	5	6	7	8	9	10
1. Age	1.00									
2. Age Symptoms Began	.52**	1.00								
3. Income	.00	.04	1.00							
4. Symptom Duration	.53**	−.44**	−.05	1.00						
5. Medical Visits	.01	−.03	−.08	.05	1.00					
6. Comorbidities	.40**	.07	−.20**	.35**	.26**	1.00				
7. Depression	.02	.02	−.15**	−.01	.10	.21**	1.00			
8. Anxiety	−.05	−.04	−.11*	−.01	.06	.17**	.68**	1.00		
9. Symptom Severity	−.08	−.07	−.01	−.02	.09	.11*	.22**	.17**	1.00	
10. Quality of Life	.11*	−.10	.05	.03	−.15**	−.15**	−.43**	−.37**	.46**	1.00

*
$p < .05$;

**
$p < .01$

Table 3

Results of Multiple Linear Regression Models Relating Anxiety, Depression, Symptom Severity, and Quality of Life (Outcomes) to Age (Moderator) and Medical Comorbidities (Predictor).

Models	B(SE)	β	F	R^2	Adj. R^2	R^2	F-change
Anxiety							
Step 1			$F_{(6,355)}= 5.56$**	.09	.07	--	----
Constant	10.44 (1.53)**	---					
Education	-1.03 (0.35)**	-.15					
Income	-0.01 (0.01)	-.06					
Married	0.11 (0.57)	-.01					
Gender	-1.19 (0.62)	-.10					
Age	-0.05 (0.02)**	-.16					
medical comorbidities	0.14 (0.04)**	.20					
Step 2			$F_{(7,354)}= 5.82$**	.10	.09	.02	$F_{(1,354)}=6.86$**
Constant	11.24 (1.55)**	---					
Education	-1.04 (0.35)**	-.16					
Income	-0.01 (0.01)	-.07					
Married	-0.08 (0.57)	-.01					
Gender	-1.28 (0.61)	-.12					
Age	-0.05 (0.02)**	-.15					
medical comorbidities	0.19 (0.04)**	.25					
Age*medical comorbidities	-0.01 (0.01)*	-.15					
Depression							
Step 1			$F_{(6,355)}= 6.30$**	.10	.08	--	----
Constant	9.44 (1.43)**	---					
Education	-1.05 (0.33)**	-.17					
Income	-0.01 (0.01)	-.06					
Married	-0.49 (0.52)	-.05					
Gender	-0.81 (0.58)	-.10					

Models	B(SE)	β	F	R^2	Adj. R^2	R^2	F-change
Age	−0.02 (0.02)	−.16					
medical comorbidities	0.14 (0.04)**	.21					
Step 2			F (7,354)= 7.58**	.13	.11	.03	F(1,354)=13.89**
Constant	10.48 (1.44)**	---					
Education	−1.07 (0.33)**	−.16					
Income	−0.01 (0.01)	−.08					
Married	−0.73 (0.52)	−.08					
Gender	−1.05 (0.57)	−.09					
Age	−0.02 (0.02)	−.07					
medical comorbidities	0.19 (0.04)**	.28					
Age*medical comorbidities	−0.02 (0.01)**	−.21					
Symptom Severity							
Step 1			F (6,358)= 3.150**	.05	.03	--	
Constant	239.30 (23.80)**	---					
Education	3.82 (5.51)	.04					
Income	−0.06 (0.08)	−.04					
Married	18.41 (8.75)*	.13					
Gender	16.03 (9.52)	.09					
Age	−0.80 (0.29)**	−.16					
medical comorbidities	2.04 (0.65)**	.18					
Step 2			F (7,357)= 2.73**	.05	.03	.00	F(1,357)=0.25
Constant	241.71 (24.32)**	---					
Education	3.78 (5.51)	.04					
Income	−0.06 (0.09)	−.04					
Married	17.85 (8.82)*	.12					
Gender	15.47 (9.59)	.09					
Age	−0.81 (0.29)**	−.16					
medical comorbidities	2.17 (0.69)**	.19					

Models	B(SE)	β	F	R^2	Adj. R^2	R^2	F-change
Age*medical comorbidities	−0.02 (0.04)	−.03					
Quality of Life							
Step 1			F (6,359)= 5.06**	.08	.06	--	---
Constant	46.95 (5.86)**	---					
Education	3.37 (1.36)*	.13					
Income	0.01 (0.02)	.04					
Married	−4.40 (2.18)*	−.12					
Gender	−0.32 (2.34)	−.01					
Age	0.26 (0.07)**	.21					
medical comorbidities	−0.61 (0.16)**	−.22					
Step 2			F (7,358)= 4.34**	.08	.06	.00	F(1,358)=0.09
Constant	45.59 (5.98)**	---					
Education	3.37 (1.36)*	.13					
Income	0.01 (0.02)	.04					
Married	−4.32 (2.19)*	−.12					
Gender	−0.24 (2.36)	−.01					
Age	0.26 (0.07)**	.21					
medical comorbidities	−0.62 (0.17)**	−.22					
Age*medical comorbidities	0.00 (0.01)	.02					

Note:

*
$p < .05$,

**
$p < .01$.